

CONTENTS.

PAPERS.

No.	MONTH.		PAGE.
CCXXXII.	(January.)	Experiments upon Phoenix Columns.
		Presented June 15, 1881.—CLARKE, REEVES & Co....	1
CCXXXIII.	(Feb.-March.)	Discussions upon Wrought-Iron Columns, Tesus and Formule.....	61
		By G. BOUCAREN.....	62
		By THEODORE COOPER.....	66
		By D. J. WHITTEMORE.....	91
		By CHARLES E. EMERY.....	93-97
		By DE VOLSON WOOD.....	95
		By C. L. STROBEL.....	98
		By A. S. C. WURTELE.....	110
		By WILLIAM H. BURR.....	111
		By MANSFIELD MERRIMAN.....	115
		By C. L. GATES.....	118
		By JAMES E. HOWARD.....	119
		By THOMAS C. CLARKE.....	120
CCXXXIV.	(April.)	Averaging Machine.	
		Read March 1, 1882.—W. S. AUCHINCLOSS.....	121
CCXXXV.	(do.)	On the Removal of Incrustations in Water Mains; a description of the operations performed in Halifax, N. S., Canada.	
		Read March 1, 1882.—E. H. KEATING.....	127
CCXXXVI.	(do.)	On the Mode of Underpinning adopted for the Croton Lake Bridge, N. Y. C. & N. R. R., during the Repairs to the Masonry Piers	
		Read April 5, 1882.—A. P. BOLLER.....	150
CCXXXVII.	(May.)	Annual Address.	
		Read at the Convention of the Society, Washington, May 16, 1882.—ASHBEL WELCH.....	153
CCXXXVIII.	(June.)	Sub-Aqueous Underpinning.	
		Read at the Annual Convention, May 17, 1882.—A. G. MENOCAL.....	181
CCXXXIX.	(do.)	The Mean Velocity of Streams flowing in Natural Channels.	
		Read February 15, 1882.—ROBERT E. MC MATH.....	186

IV

NO.	MONTH.		PAGE.
CCXL.	(July.)	On the Determination of the Flood Discharge of Rivers and of the Back Water caused by Contractions.	
		Read December 21, 1882.—WILLIAM R. HUTTON....	211
.....	(do.)	Discussion on the Flood Discharge of Rivers:	
		By THEODORE G. ELLIS.....	228
		By ROBERT E. McMATH.....	232
		By WILLIAM R. HUTTON.....	234
CCXLII.	(do.)	Accuracy of Measurement as Increased by Repetition.	
		Presented at the Annual Convention, May 17, 1882.	
		—STEPHEN S. HAIGHT.....	242
CCXLII.	(August.)	The Overflow of the Mississippi River.	
		Read March 15, 1882.—LYMAN BRIDGES.....	251
.....	(do.)	Discussion on the Overflow of the Mississippi River:	
		By E. L. CORTELL.....	256
		By J. A. OCKERSON.....	272
		By LYMAN BRIDGES.....	274
CCXLIII.	(do.)	Highway Bridges.	
		Presented at the Annual Convention, May 19, 1882.	
		—JAMES OWEN.....	277
.....	(do.)	Discussion on Bridges:	
		By ASHBEL WELCH.....	287
CCXLIV.	(September.)	Uniformity in Railway Rolling Stock.	
		Read June 21, 1882.—O. CHANUTE.....	291
CCXLV.	(do.)	The Hudson River Tunnel.	
		Read at the Annual Convention, May 19, 1882.—	
		WILLIAM SOOT SMITH.....	314
.....	(do.)	Discussion on the Hudson River Tunnel:	
		By WILLIAM H. PAINE.....	323
CCXLVI.	(October.)	Preservation of Timber.	
		Preliminary Report of the Committee. Presented at the Annual Convention, May 16, 1882.—O. CHANUTE, Chairman.....	325
.....	(do.)	Letters accompanying Report on the Preservation of Timber:	
		By JAMES B. FRANCIS.....	333
		By J. W. HOBART.....	335
		By HUGH RIDDELL.....	335
		By M. ALEXANDER.....	336
		By J. W. PUTNAM.....	337
		By M. G. HOWE.....	342
CCXLVII.	(do.)	The Kyan Process for Preservation of Timber; its use and effect at Fort Ontario, N. Y., 1839 to 1882.—WILLIAM P. JUDSON.....	345

No.	MONTH.	PAGE.
.....	(October.)	Discussion on the Preservation of Timber:
		By MENDES COHEN..... 355 By A. GOTTLIEB..... 356 By T. EGLESTON..... 356, 358 By JAMES B. FRANCIS..... 357 By CLEMENS HERSCHEL..... 358 By EDWARD R. ANDREWS..... 360
CXLVIII.	(November.)	On the Increased Efficiency of Railways for the Transportation of Freight.
		Read December 20, 1882.—WILLIAM P. SHINN..... 365
CXLIX.	(do.)	Rapid Methods in Topographical Surveying.
		Read September 20, 1882.—WILLIAM BELL DAWSON..... 397
.....	(December.)	Discussion on Rapid Methods in Topographical Surveying:
		By JAMES P. ALLEN..... 405
CCL.	(do.)	Weights and Measures.
		Read June 18, 1881.—FREDK. BROOKS..... 406
.....	(do.)	Discussion on Weights and Measures:
		By JACOB M. CLARE..... 412
CCLI.	(do.)	On the Care and Maintenance of Iron Bridges.
		Read October 18, 1882.—HENRY D. BLUNDEN..... 418
.....	(do.)	Discussion on the Care and Maintenance of Bridges:
		By THEODORE COOPER..... 424
CCLI.	(do.)	A Peculiar Phase of Metallic Behavior.
		Presented May 17, 1882.—O. E. MICHAELIS..... 429
.....	(do.)	Discussion on a Peculiar Phase of Metallic Behavior:
		By T. EGLESTON..... 432
		By O. E. MICHAELIS..... 436

ILLUSTRATIONS.

PLATE.	MONTH.		PAPER.	PAGE.
.....	(January.)	Diagram Illustrating Experiments upon Phoenix Columns.....	CCXXXII.	2
.....	(do.)	Cut Illustr'g Specimen of Phoenix Columns.....	CCXXXII.	7
.....	(do.)	do. do. Experiments upon Phoenix Columns.....	CCXXXII.	15
.....	(do.)	do.	CCXXXII.	53
.....	(do.)	do.	CGXXXII.	55
.....	(Feb.-Mar.)	Diagram Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	64
.....	(do.)	Cut Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	73
.....	(do.)	Cut Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	74
I.	(do.)	Diagram Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	90
II.	(do.)	Diagram Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	90
.....	(do.)	Diagram Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	94
.....	(do.)	Cut Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	108
.....	(do.)	Diagram Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	112
.....	(do.)	Diagram Illustrating Discussion upon Wrought-Iron Columns.....	CCXXXIII.	118
.....	(April.)	Cuts Illustrating the Averaging Machine.....	COXXXIV.	122
.....	(do.)	do. do. do. do.	COXXXIV.	123
.....	(do.)	do. do. do. do.	COXXXIV.	125
.....	(do.)	do. do. Scraper for Water Mains.....	COXXXV.	135
III.	(do.)	Plan and Profile, Pipe Lines, City of Halifax.....	COXXXV.	140
IV.	(do.)	Illustration of Arrangement of Pipes, Valves, Hatch-Boxes and Man-Holes, Halifax Water Works.....	COXXXV.	141
V.	(do.)	Illustration of Mode of Underpinning adopted for Croton Lake Bridge during Repairs to Masonry Piers.....	COXXXVI.	152
VI.	(June.)	Quay Wall at Gosport Navy Yard.....	CCXXXVIII.	182
VII.	(do.)	Diagram of Discharge over Tremont Weir.....	CCXXXIX.	188
VIII.	(do.)	Diagram from Francis Lowell Experiments.....	CCXXXIX.	194
IX.	(do.)	do. do. do.	CCXXXIX.	196
X.	(do.)	do. do. do.	CCXXXIX.	198
XI.	(do.)	Diagram from Ellis' Connecticut Experiments...	CCXXXIX.	200
XII.	(do.)	do. do. do.	COXXXIX.	202

VII

PLATE.	MONTH.		
XIII.	(June)	Diagram from Columbus Gauge of Mississippi..	PAPER. PAGE. CCXXXIX. 204
XIV.	(do.)	do. Vicksburg do. ..	CCXXXIX. 206
XV.	(do.)	do. Carrollton do. ..	COXXXIX. 208
XVI.	(do.)	Diagram of Conditions related to Mean Velocity.	
XVII.	(July.)	Map of Site of Crossing of the New York, Lake Erie and Western Railroad by the New York, Lackawanna and Western Railway.....	CCXL. 216
XVIII.	(do.)	Cross Section of Preceding Map.....	CCXL. 220
XIX.	(do.)	Profiles of Water Surface.....	CCXL. 224
XX.	(do.)	Plans and Profiles.....	CCXL. 226
XXI.	(do.)	Profiles of Water Surface.....	CCXL. 228
XXII.	(do.)	Plan of Streets in part of New York City.....	CCXL. 244
XXIII.	(do.)	do. do. do. ..	CCXL. 246
XXIV.	(do.)	Repetition of Angular Measurements.....	CCXL. 248
XXV.	(do.)	Calculated Positions of Monuments.....	CCXL. 248
.....	(do.)	Cut Illustrating Accuracy of Measurement as increased by Repetition.....	CCXL. 250
XXVI.	(August.)	Map of Portion of the Mississippi Delta.....	CCXL. 254
XXVII.	(do.)	Approximate Section of the Mississippi River at Carrolton.....	CCXLII. 266
XXVIII.	(do.)	Illustrations of Highway Bridges.....	CCXLII. 282
XXIX.	(do.)	do. do. ..	CCXLII. 284
XXX.	(do.)	do. do. ..	CCXLII. 286
.....	(September.)	Cuts of Grip Bolt and Spiral Wedge Nut.....	CCXLIV. 311
XXXI.	(do.)	Hudson River Tunnel, Jersey Side.....	CCXLV. 318
XXXII.	(do.)	Hudson River Tunnel with relation to the Bulk- head Wall in New York City.....	CCXLV. 320
XXXIII.	(do.)	Hudson River Tunnel, New York Caisson.....	CCXLV. 322
XXXIV.	(December.)	Illustration showing Value of Merchandise Im- ported into the United States, subdivided by Countries where produced or grown.....	CCL. 412
XXXV.	(do.)	Illustration of a Peculiar Phase of Metallic Behavior.....	CCLII. 430
XXXVI.	(do.)	Illustration of a Peculiar Phase of Metallic Behavior.....	CCLII. 430
XXXVII.	(do.)	Illustration of a Peculiar Phase of Metallic Behavior.....	CCLII. 430
XXXVIII.	(do.)	Illustration of a Peculiar Phase of Metallic Behavior.....	CCLII. 430
XXXIX.	(do.)	Illustration of a Peculiar Phase of Metallic Behavior.....	CCLII. 430
XL.	(do.)	Illustration of a Peculiar Phase of Metallic Behavior.....	CCLII. 432
XLI.	(do.)	Illustration of a Peculiar Phase of Metallic Behavior.....	CCLII. 432
			CCLII. 432